

SPECIAL HANDLING

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DOC. NO. X-239.  
COPY 2 OF 5  
PAGES 8

EXC-7280  
COPY 2 OF 3

PROGRESS REPORT

Period of March 1 to March 31, 1964

Contract No. AF33(600)40280

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## TABLE OF CONTENTS

### PROGRAM

A	F-101 Flight Test . . . . .	3
B	Phase II Flight Test . . . . .	4
C	Environmental Test. . . . .	6

### EQUIPMENT

D	Recorder . . . . .	6
E	Antenna . . . . .	7
F	Spares . . . . .	8

A F-101 FLIGHT TEST

The major effort this month was to determine the cause of film striping, continuing to use units of system 2. The results of all four flights this month, S-100 through S-103, were degraded by several types of striping-525 cps noise, a variable frequency modulation due to local oscillator leakage, and abrupt changes in video level. Replacing the TR tube and a Parker waveguide adapter eliminated the 525 cycle noise on the last two flights. The leakage L. O. modulation and level fluctuations remained. Cause of the video level changes is difficult to isolate because the level changes do not occur during ground test and cannot be seen on the radar operator's A scope in flight. Since the correlator was dismantled during this reporting period, no correlated film was received or evaluated.

A test was performed to determine the ability of the accelerometer network to correct for doppler frequencies due to aircraft accelerations. A low frequency (0.4 cps) oscillator was connected to the pitch axis of the aircraft autopilot and its amplitude adjusted to cause 0.2 to 0.3 g peak to peak accelerations. It was calculated that these maneuvers should produce doppler variations of 50 to 75 cps. However, the instrumentation recording of the accelerometer network signal to the DFT indicated only a correction of 28 cps.

A lower frequency oscillation (0.04 cps) produced maneuvers calculated to cause doppler variations of 220 cps. The corresponding frequency correction was measured to be only 120 cps. Both tests indicate that the VFO scale factor is off by about 2:1 and requires calibration.

SPECIAL HANDLING

Spectra of DFT gate signals were made for flights S-100, S-101 and S-103. In general, the spectra show an increase in L. O. leakage signal of approximately 5 db when compared to other recent flights, accounting for "sloppy" tracking and verifying modulation observed on the film.

Two failures were encountered this month. The transmitter TWT failed after flight S-102; the breadboard transmitter was substituted to permit continuation of flight. Replacing resistors in the torque motor circuit corrected a film transport failure.

#### B PHASE II FLIGHT TEST

All four field engineers arrived at the flight test location, as did the radar system, instrumentation and ground support equipment. The equipment was checked out in the laboratory, with a few minor discrepancies cleared. A trouble still exists in the variable frequency oscillator for the DFT which prevents adjusting frequency.

The Single Axis Platform was inspected by the Minneapolis-Honeywell representatives in the field to check for loose hardware as noted during the vibration tests.

Preliminary flight plans were discussed with the flight test engineers at the location. Desired limits on flight parameters appeared to be within reason from vehicle considerations. Flight time and courses were also discussed. Evidently flights with the APQ-93 radar are not immediately planned, although installation and check-out with the vehicle wiring and navigation system are important to prove compatibility.

SPECIAL HANDLING

Design and drafting of corner reflectors for the Phase II program is complete. The quantities and sizes selected are:

QUANTITY	SIZE (ft <sup>2</sup> )
6	10
14	100
14	1000
6	10000

Design of a reflector alignment tool has been completed and parts ordered. A limited quantity of spheres is being considered for system sensitivity checks.

Sketches of corner reflectors for the program have been sent to the location for estimates of cost of fabrication. Tentative plans were made for their placement near the test location.

Only general information has been obtained concerning motional vehicle disturbances produced by vibrations or flight path perturbations during flight, plus one short run of accelerometer data. More information is desired.

Standard reporting procedures have been established between the field location and Aerospace in Baltimore, including weekly progress reports, failure reports, spares usage, and equipment status log. The marginal linearity of the position feedback transducer on the antenna actuator was discussed with vehicle personnel. Delivery of the more linear transducer has not been determined, but may prevent its use on the first flight.

The run of interconnecting waveguide is expected to include a 24 inch length of high temperature flexible waveguide. Flexing tests of low temperature waveguide has indicated a life expectancy of over 5,000 cycles of full flexure. The high temperature waveguide capable of handling full power will be tested as soon as received.

## C ENVIRONMENTAL TEST

Exploratory vibration was performed on the Nav-Tie Unit. No mechanical or electrical deterioration occurred due to vibration. Detailed results are given in STM 154.

Exploratory vibration was performed on the Single Axis Platform. No dwell test was performed at the resonance frequencies and input amplitudes were reduced to insure that the tests would be non-destructive. Fore and aft gimbal resonance, with amplifications in the order of 30, occurred from vibration in any axis. Although it is predicted that the unit will be damaged in the MIL-T-5422 environment, the unit will not be damaged in its expected environment. The vendor was notified of the test results. Details are given in STM 153.

Temperature-altitude testing was performed on the Frequency Generator. The data has not been completely evaluated but a cursory glance indicates that temperature compensation is required. The STM for this test will be ready next month.

## D RECORDER

Work continued on Recorder #7 at Itek to improve its operation with both thin and thick base film. An improvement in the torque control circuit using a differential amplifier provides a greater range of torque control and eliminates changing Globe motors for different film speed.

Temperature tests on the breadboard focus modulation circuit determined that the large portion of voltage change with temperature was caused by filter capacitors which will be replaced. Over-voltage cathode-to-filament on the 6U8 will be corrected by obtaining filament voltage from a separate filament transformer.

Changes in Recorder #7 grounding have reduced the undesired coupling between circuits. Also, the interference from the data flash circuit has been reduced by some rewiring and rearrangement of parts. Further improvement can be made through the reduction of the trigger and discharge circuit voltage.

#### E ANTENNA

The test module with the entire fabric surface coated with bonding material had several more laminate seals fail during the process of replacing the previous failures. Since these additional failures indicate that no benefit is gained by changing the technique of bonding, this phase of the work has been stopped.

Electrical tests have been completed on most of the samples received. Measurements of stick gain, side lobe level, beam shape, and insertion loss are similar for the three most promising fabrics- Dupont ML and Westinghouse I7 and I8.

Heat-pressure-life tests have reached 993 hours of exposure to 550°F and 30 psig plus a total of 18 hours of exposure to -65°F with no pressure applied. No leakage is apparent from the ML, I7 and I8 fabrics.

Tensile tests were made as a test for delamination. Blocks of aluminum were bonded to each face of the fabric sample and then pulled apart in a tensile machine. In general, the ML fabric required an average force of 652 psi to cause a delamination failure, the I7 required an average of 1600 psi and the I8 required 2242 psi average. For both the I7 and I8, the failures were bond failures and no signs of delamination were noticed.

Improvements determined as feasible and desirable on Recorder #7 will be incorporated next month into Recorder #6, now in use in the F-101 flight test.

The failure of high voltage power supply #9760 was traced to contamination of the silicon oil. Replacing with fresh oil has cleared this fault.

Peel test samples were then made by bonding fabric strips to strips of aluminum. These samples were then pulled in a manner to cause the fabric to peel off the metal backing. The peel strengths of the ML averaged 1.13 lbs/in. In every sample of ML, the failure was caused by delamination and tearing of the varnish layers. Both the I7 and I8 had average peel strengths of 20 to 30 lbs./in. All failures of the I7 and I8 samples were adhesive failures; no signs of delamination were noted.

On the basis of the above tests and availability, I8 was chosen to replace the ML. A purchase order for this material was placed and rework of the No. 3 antenna will start as soon as the fabric is received.

#### F SPARES

The spares program is monitored to keep spares up with the latest system modifications. Fourteen assemblies are still in fabrication, 72 purchase orders are incomplete on system spares. Spares for the Ground Support Equipment are more nearly complete, but some items have only recently been added to the list.